

Claims:

1. A filter adaptation unit suitable for producing a set of filter coefficients, said filter adaptation unit comprising:
 - 5 a) a first input for receiving a sequence of samples of a first signal;
 - b) a second input for receiving a sequence of samples of a second signal, the second signal including a component which is correlated to the first signal;
 - c) a scheduling controller operative for generating a scheduling signal including a succession of scheduling commands, the scheduling command indicating that a new set of filter coefficients is to be computed, the scheduling signal being such that a new scheduling command is issued when at least two samples of the first signal are received subsequent to a previously issued scheduling command;
 - 10 d) a processing unit operatively coupled to said first and second inputs, said processing unit being responsive to a scheduling command from said scheduling controller to generate a set of filter coefficients at least in part on the basis of said first and second signals, the set of filter coefficients being such that when the set of filter coefficients are applied by a filter on the first signal, an estimate of the component in the second signal is generated, the component being correlated to the first signal;
 - 15 e) an output for releasing an output signal indicative of the set of filter coefficients generated by the processing unit.
2. A filter adaptation unit as defined in claim 1, wherein said processing unit is operative for applying a least squares method on the first and second signals to derive the set of filter coefficients.
- 25 3. A filter adaptation unit suitable for producing a set of filter coefficients, said filter adaptation unit comprising:
 - a) a first input for receiving a sequence of samples of a first signal;
 - 30 b) a second input for receiving a sequence of samples of a second signal, the second signal including a component which is correlated to the first signal;

- 5 c) a scheduling controller operative for generating a scheduling signal including a succession of scheduling commands, the scheduling command indicating that a new set of filter coefficients is to be computed, the scheduling signal being such that a new scheduling command is issued when at least two samples of the first signal are received subsequent to a previously issued scheduling command;
- d) a processing unit operatively coupled to said first and second inputs:
- i. for a new sample of said first signal, said processing unit being operative for processing said sequence of samples of the first signal to generate a first set of data elements, the first set of data elements being a compressed version of a second set of data elements;
 - 10 ii. for a new sample of said second signal, said processing unit being operative for processing said sequence of samples of the second signal to generate a third set of data elements;
 - 15 iii. in response to a scheduling command from said scheduling controller, said processing unit being operative for:
 - (a) processing said first set of data elements to generate the second set of data elements;
 - (b) processing the second set of data elements and the third set of data elements to generate a set of filter coefficients by applying a least squares method, the set of filter coefficients being such that when the set of filter coefficients are applied by a filter on the first signal, an estimate of the component in the second signal is generated, the component being correlated to the first signal;
 - 20 e) an output for releasing an output signal indicative of the set of filter coefficients generated by the processing unit.
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4. A filter adaptation unit as defined in claim 3, wherein said second set of data elements is indicative of a set of auto-correlation data elements for the sequence of samples of the first signal, said set of auto-correlation data elements being a representation of a two-dimensional matrix data structure.
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5. A filter adaptation unit as defined in claim 4, wherein said first set of data elements includes a sub-set of the set of auto-correlation data elements.
6. A filter adaptation unit as defined in claim 4, wherein said sub-set of the set of auto-correlation data elements corresponds to either one of a row and a column of the two-dimensional matrix data structure.
7. A filter adaptation unit as defined in claim 5, wherein the two-dimensional matrix data structure is of dimension $N \times N$, said first set of data elements including:
 - i. a sub-set of auto-correlation data elements, said sub-set of auto-correlation data elements corresponding to either one of a row and a column of the two-dimensional matrix data structure;
 - ii. a first sample set including $N-1$ first received samples of the first signal;
 - iii. a second sample set including $N-1$ last received samples of the first signal;
8. A filter adaptation unit as defined in claim 5, wherein said third set of data elements is indicative of a set of cross-correlation data elements for the sequence of samples of the first signal and the sequence of samples of the second signal.
9. A filter adaptation unit as defined in claim 8, wherein for each new received samples of the first and second signals, said processing unit being operative to:
 - a) process a set of previously received samples of the first signal and a new sample of the first signal to update the first set of data elements;
 - b) process the set of previously received samples of the first signal and the new sample and a new sample of the second signal to update the set of cross-correlation data elements;
 - c) upon receipt of a scheduling command from said scheduling :
 - i. process the first set of data elements to generate the second set of data elements being a representation of an auto-correlation matrix data structure;

- ii. process the auto-correlation matrix data structure and the cross-correlation data elements to derive a set of filter coefficients.

10. A filter adaptation unit as defined in claim 9, wherein said processing unit is
5 responsive to the scheduling command for:

- a) applying a Cholesky decomposition method to the auto-correlation matrix data structure to derive a lower triangular matrix data structure and an upper triangular matrix data structure;
- b) processing the lower triangular matrix data structure and the upper triangular
10 matrix data structure on the basis of the cross-correlation data elements to derive the set of filter coefficients.

11. A method for producing a set of filter coefficients comprising:

- a) receiving a sequence of samples of a first signal;
- 15 b) receiving a sequence of samples of a second signal, the second signal including a component which is correlated to the first signal;
- c) receiving a scheduling signal including a succession of scheduling commands, the scheduling command indicating that a new set of filter coefficients is to be computed, the scheduling signal being such that a new scheduling command is
20 issued when at least two samples of the first signal are received subsequent to a previously issued scheduling command;
- d) in response to a scheduling command, generating a set of filter coefficients at least in part on the basis of said first and second signals, the set of filter coefficients being such that when the set of filter coefficients are applied by a
25 filter on the first signal, an estimate of the component in the second signal is generated, the component being correlated to the first signal;
- e) releasing an output signal indicative of the set of filter coefficients.

12. A method as defined in claim 11, said method comprising applying a least squares
30 algorithm on the first and second signals to derive the set of filter coefficients.

13. A method as defined in claim 12, wherein said method comprises:

- a) for a new sample of said first signal, processing said sequence of samples of the first signal to generate a first set of data elements, the first set of data elements being a compressed version of a second set of data elements;
- b) for a new sample of said second signal, processing said sequence of samples of the second signal to generate a third set of data elements;
- 5 c) in response to a scheduling command:
- i. processing said first set of data elements to generate the second set of data elements;
- ii. processing the second set of data elements and the third set of data elements to generate the set of filter coefficients.
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14. A method as defined in claim 13, wherein said second set of data elements is indicative of a set of auto-correlation data elements for the sequence of samples of the first signal, said set of auto-correlation data elements being a representation of a two-dimensional matrix data structure.
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15. A method as defined in claim 14, wherein said first set of data elements includes a sub-set of the set of auto-correlation data elements.
- 20 16. A method as defined in claim 14, wherein said sub-set of the set of auto-correlation data elements corresponds to either one of a row and a column of the two-dimensional matrix data structure.
17. A method as defined in claim 15, wherein the two-dimensional matrix data structure is of dimension $N \times N$, said first set of data elements including:
- 25 i. a sub-set of auto-correlation data elements, said sub-set of auto-correlation data elements corresponding to either one of a row and a column of the two-dimensional matrix data structure;
- ii. a first sample set including $N-1$ first received samples of the first signal;
- 30 a second sample set including $N-1$ last received samples of the first signal;

said method comprising generating said second set of data elements at least in part on the basis of the first sample set, the second sample set and the sub-set of auto-correlation data elements.

5 18. A method as defined in claim 15, wherein said third set of data elements is indicative of a set of cross-correlation data elements for the sequence of samples of the first signal and the sequence of samples of the second signal.

19. A method as defined in claim 18, wherein said method comprises:

- 10 a) for a new received sample of the first signal:
- i. processing a set of previously received samples of the first signal and a new sample of the first signal to update the first set of data elements;
 - ii. processing the set of previously received samples of the first signal and the new sample and a new sample of the second signal to update the set of cross-
- 15 correlation data elements;
- b) in response to a scheduling command:
- i. processing the first set of data elements to generate the second set of data elements being a representation of an auto-correlation matrix data structure;
 - ii. processing the auto-correlation matrix data structure and the cross-
- 20 correlation data elements to derive a set of filter coefficients.

20. A method as defined in claim 19, wherein said method comprises, in response to the scheduling command:

- a) applying a Cholesky decomposition method to the auto-correlation matrix data
- 25 structure to derive a lower triangular matrix data structure and an upper triangular matrix data structure;
- b) processing the lower triangular matrix data structure and the upper triangular matrix data structure on the basis of the cross-correlation data elements to derive the set of filter coefficients.

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21. A computer readable medium including a program element suitable for execution by a computing apparatus for producing a set of filter coefficients, the filter coefficients being suitable for use by a filter, said computing apparatus comprising:

- a) a memory unit;
- 5 b) a processor operatively connected to said memory unit, said program element when executing on said processor being operative for:
 - i. receiving a sequence of samples of a first signal;
 - ii. receiving a sequence of samples of a second signal, the second signal including a component which is correlated to the first signal;
 - 10 iii. receiving a scheduling signal including a succession of scheduling commands, the scheduling command indicating that a new set of filter coefficients is to be computed, the scheduling signal being such that a new scheduling command is issued when at least two samples of the first signal are received subsequent to a previously issued scheduling command;
 - 15 iv. in response to a scheduling command, generating a set of filter coefficients at least in part on the basis of said first and second signals, the set of filter coefficients being such that when the set of filter coefficients is applied by a filter on the first signal, an estimate of the component in the second signal is generated, the component being correlated to the first signal;
 - 20 v. releasing an output signal indicative of the set of filter coefficients.

22. A computer readable medium as defined in claim 21, said program element when executing on said processor being operative for applying a least squares algorithm on the first and second signals to derive the set of filter coefficients.

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23. A computer readable medium as defined in claim 22, wherein said program element when executing on said processor being operative to:

- a) for a new sample of said first signal, process said sequence of samples of the first signal to generate a first set of data elements, the first set of data elements being a compressed version of a second set of data elements;
- 30 b) for a new sample of said second signal, process said sequence of samples of the second signal to generate a third set of data elements;

c) in response to a scheduling command:

- i. process said first set of data elements to generate the second set of data elements;
- ii. process the second set of data elements and the third set of data elements to generate the set of filter coefficients.

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24. A computer readable medium as defined in claim 23, wherein said second set of data elements is indicative of a set of auto-correlation data elements for the sequence of samples of the first signal, said set of auto-correlation data elements being a representation of a two-dimensional matrix data structure.

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25. A computer readable medium as defined in claim 24, wherein said first set of data elements includes a sub-set of the set of auto-correlation data elements.

15 26. A computer readable medium as defined in claim 24, wherein said sub-set of the set of auto-correlation data elements corresponds to either one of a row and a column of the two-dimensional matrix data structure.

20 27. A computer readable medium as defined in claim 25, wherein the two-dimensional matrix data structure is of dimension $N \times N$, said first set of data elements including:

iii. a sub-set of auto-correlation data elements, said sub-set of auto-correlation data elements corresponding to either one of a row and a column of the two-dimensional matrix data structure;

iv. a first sample set including $N-1$ first received samples of the first signal;

25 a second sample set including $N-1$ last received samples of the first signal;

said program element when executing on said processor being operative for generating said second set of data elements at least in part on the basis of the first sample set, the second sample set and the sub-set of auto-correlation data elements.

30 28. A computer readable medium as defined in claim 25, wherein said third set of data elements is indicative of a set of cross-correlation data elements for the sequence of samples of the first signal and the sequence of samples of the second signal.

29. A computer readable medium as defined in claim 28, wherein said program element when executing on said processor being operative to:

- a) for a new received sample of the first signal:
 - 5 i. process a set of previously received samples of the first signal and the new sample of the first signal to update the first set of data elements;
 - ii. process the set of previously received samples of the first signal and the new sample and a new sample of the second signal to update the set of cross-correlation data elements;
- 10 b) in response to a scheduling command:
 - i. process the first set of data elements to generate the second set of data elements being a representation of an auto-correlation matrix data structure;
 - ii. process the auto-correlation matrix data structure and the cross-correlation data elements to derive a set of filter coefficients.

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30. A computer readable medium as defined in claim 29, wherein in response to the scheduling command said program element when executing on said processor being operative for:

- a) applying a Cholesky decomposition method to the auto-correlation matrix data structure to derive a lower triangular matrix data structure and an upper triangular matrix data structure;
- 20 b) processing the lower triangular matrix data structure and the upper triangular matrix data structure on the basis of the cross-correlation data elements to derive the set of filter coefficients.

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31. An adaptive filter comprising:

- a) a first input for receiving a sequence of samples from a first signal;
- b) a second input for receiving a sequence of samples of a second signal, the second signal including a component which is correlated to the first signal;
- 30 c) a filter adaptation unit operatively coupled to said first and second inputs, said filter adaptation unit comprising:

- 5 i. a scheduling controller operative for generating a scheduling signal including a succession of scheduling commands, the scheduling command indicating that a new set of filter coefficients is to be computed, the scheduling signal being such that a new scheduling command is issued when at least two samples of the first signal are received subsequent to a previously issued scheduling command;
- ii. a processing unit responsive to a scheduling command from said scheduling controller to generate a set of filter coefficients at least in part on the basis of said first and second signals;
- 10 iii. an output for releasing an output signal indicative of the set of filter coefficients generated by the processing unit;
- d) a filter operatively coupled to said first input and to the output of said filter adaptation unit, said filter being operative to apply a filtering operation to the first signal on the basis of the set of filter coefficients received from said filter adaptation unit to generate an estimate of the component in the second signal, the component being correlated to the first signal.
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32. An echo cancellor comprising the adaptive filter of claim 31.